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STRUCTURAL PANEL MADE OF GYPSUM WITH A MANTLE OF GLASS FIBERS

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Claims

1. Structural panel made of gypsum with a mantle of glass fibers, characterized by the fact that the gypsum structural panel has a mantle of a ribbon-like material in the manner of known gypsum plasterboard, where said mantle consists of a glass fiber fabric or interlaid scrim with a chopped strand mat (4) formed on it in such a manner that the interlaid scrim or fabric

(2, 3) and the chopped strand mat (4) together form a single unit, and that the interlaid scrim or fabric layer (2, 3) is facing the surface of the gypsum.

2. Structural panel made of gypsum as per Claim 1, characterized by the fact that the chopped strand mat (4) is designed with differing density in such a manner that the side of lower density is applied to the interlaid scrim or fabric layer (2, 3) and the side with the greater density faces the outside.

3. Structural panel made of gypsum as per Claims 1 and 2, characterized by the fact that the glass fibers have a surface treatment.

4. Structural panel made of gypsum as per Claims 1 and 2, characterized by the fact that the glass fibers are coated on the surface with a wetting agent.

5. Structural panel made of gypsum as per Claims 1 to 4, characterized by the fact that the gypsum slurry to form the core (1) of the panel, consists of a mixture of α- and/or ß-semihydrate gypsum and contains fibers and also a wetting agent.

6. Structural panel made of gypsum as per Claims 1 to 5, characterized by the fact that the outer surfaces of the mantle consisting of glass fiber interlaid scrim or fabric layer and chopped strand mat, are provided with an adhesion-promoting layer (primer coat) or another surface coating.

7. Structural panel made of gypsum as per Claims 1 to 6, characterized by the fact that the strands (2 and 3) of the chopped strand mat are of different thickness.

The invention pertains to a structural panel using gypsum with a mantle made of glass fibers.

Structural panels made of gypsum are known in their various designs. Most widely used and also the most widely known gypsum structural panels are with a cardboard mantle that are used in the construction industry under the designation gypsum plasterboard due to their numerous advantages. This gypsum cardboard panel is usually produced in dimensions of 2.50 m by 1.25 m in differing thicknesses. These panels are used most commonly as linings for separating walls in the form of mounted walls, in which frames are constructed from studs, sill and head rails between the stories; the walls are covered on both sides with these gypsum plasterboards. The space between these panels is usually filled with a material to insulate sound and heat.

These gypsum plasterboard panels are also used extensively because they have a fire protective effect. A gypsum plasterboard panel does contain a considerable amount of water, due to the two molecules of water in the crystal, which is released gradually after exposure of the panel to elevated temperature, and this prevents a temperature rise of the panel as long as water is still evaporating from it.

The disadvantage of this gypsum plasterboard is merely that the cardboard mantle is combustible.

Thus there has been no lack of attempts to replace this combustible, cardboard mantle with a noncombustible mantle. It was suggested to use a mantle of inorganic material instead of the combustible cardboard mantle that is made of organic material, and therefore various proposals were made to use fiber

glass fabric and fiber glass mat as a mantle around these gypsum panels instead of the cardboard.

Gypsum plasterboard panels are manufactured on a machine that is first fed the front side of the cardboard on a moving, endless conveyor belt, and the edges of the cardboard are arched up so that a trough is produced into which the flowing gypsum slurry is introduced. Then the rear side of the cardboard is fed in and the entire unit is passed through shaping rollers, so that the product attains its final shape; the gypsum begins to harden and the edges of the view-side of the cardboard are folded around, so that the rear side of the cardboard will stick securely to it.

So what would be more natural than to use this well-known machinery for the manufacture of structural panels whose gypsum core will be surrounded or mantled by a product containing glass fibers.

Now in this case however, the disadvantage arises that chopped strand mat and glass fiber fabric could not be used for mantling the plastic gypsum core in this manner, because it has only a limited dimensional stability, so that large tensile forces could not be transferred to this strip-like, glass fiber material. Attempts were made to eliminate these disadvantages by designing the fabric and also the bonded fiber fabric as thicker and stronger, but then they are even less suitable for bonding with the gypsum and moreover, this increase in material is also prohibitive for economic reasons. Another disadvantage is that in an open-mesh fabric or in a bonded fiber fabric with excessively large pores, the flowable gypsum slurry will be

squeezed through this mesh and pores during the shaping process of the panel, so that a considerable fouling of the machinery and of the conveyor devices will occur, so that over short or long, the machinery will be made useless and will have to be cleaned again, because the gypsum slurry squeezed out will solidify and become hard. This also leads to economically insupportable down times.

It is also known how to coat this gypsum-permeable glass fiber fabric and/or nonwoven mat on one side with a paper strip in such a manner that the paper strip will prevent the passage of the flowable material, and secondly it allows additional force application and third, it can be pulled off after final production of the product, so that the mantle of the gypsum plasterboard panel is free of combustible substances.

But this method did not make headway, because this type of mantling material is not only complicated to produce and thus expensive, but rather also requires an additional processing step, namely the pull-off step, so that the danger exists that the applied glass fiber mat will be torn off only in some areas or points from the gypsum core. Now it turns out that the adhesion or bonding of the gypsum slurry or of the gypsum crystals with the smooth, glass fiber surface is not always satisfactory, and of course, this is due to the differences in the material, namely calcium sulfate dihydrate on the one hand, and silicic acid on the other hand.

The task of the present invention is thus to create a structural panel of the type described above, that is surrounded by a noncombustible material consisting of glass fibers, that is

easy to process on a known machine for the production of gypsum plasterboard panels, that furthermore has the necessary strength, that bonds fully and without flaws with the gypsum, and that contains noncombustible material.

This problem is solved by the fact that the gypsum structural panel has a mantle of a ribbon-like material in the manner of known gypsum plasterboard, where said mantle consists of a glass fiber fabric or interlaid scrim with a chopped strand mat formed on it in such a manner that the interlaid scrim or fabric and the chopped strand mat together form a single unit, and that the interlaid scrim or fabric layer is facing the surface of the gypsum.

Preferably the layer of bonded fiber fabric is designed as fabric or interlaid scrim and bonded fiber fabric with differing density, namely with a smaller density of the side facing the interlaid scrim or fabric and a greater density on the outside, so that initially the relatively large pores are facing the gypsum surface, and their size gradually decreases toward the outer surface of the bonded fiber fabric, so that finally, only very fine pores remain, that are present therefore only so that when drying the gypsum panel, the water vapor can escape through these pores.

In pursuit of the idea of the invention, the single glass fibers of the interlaid scrim or fabric and also the bonded fiber fabric have a surface treatment, for example, roughening, but also spraying with a wetting agent, so that a faster and tighter wetting of the glass fibers by the pourable, water-containing gypsum slurry will occur; this slurry is a slurry of α- and/or

ß-semihydrate and is called a gypsum slurry merely for convenience. Treatment of the interlaid scrim or fabric side of the mantle product with a wetting agent can take place in a preceding work step, but also shortly before the application of this glass fiber combination onto the gypsum core, for example, by spraying or moistening the side facing the gypsum core with the wetting agent, when it is coated with the wetting agent.

Processing of the glass fiber material for the mantle of the gypsum panel per this invention, takes place like the known processing of cellulose cardboard in the manufacture of gypsum plasterboard panels. The gypsum slurry is also made up in essentially the same way as for the production of gypsum plasterboard panels. Attachment of the edges of the mantled glass fiber material to the corresponding, opposing lane takes place by the use of suitable inorganic or organic adhesive in the usual glue application method or by using a gypsum slurry in a hot-melt adhesive application method, depending on the type and use of the panels being manufactured, or by mechanical clawing.

The invented panel possesses all the advantages of the known gypsum plasterboard panel and in addition, it has the added advantage that it is not combustible, and the view side of this panel has a smooth and architecturally pleasing surface that if desired, can also be colored and it then will not require any additional processing or coating. Furthermore, this glass fiber surface can also be coated with additional materials, if desired, after application of a primer coat.

The invention will now be explained with reference to an enlarged scale cross section through a panel as per the

invention; the detailed explanation will show how the mantle is made of a combination of an interlaid scrim and bonded fiber fabric.

In the cross sectional illustration, the reference numbers are 1 for the gypsum core, 2 for the glass fiber strands of the glass fiber interlaid scrim running in the plane of the sheet of the drawing, 3 for strands of the glass fiber interlaid scrim running perpendicular to the paper plane, and 4 for the chopped strand mat.

From the figures we see that the bonded fiber fabric and the interlaid scrim form a single unit, since the fibers of the bonded fiber fabric 4 partly surround the glass fiber strand 3 of the interlaid scrim, so that the interlaid scrim is joined with the bonded fiber fabric. The interlaid scrim threads are joined together in a known manner, as shown at 5, and the bonded fiber fabric 4 is produced on the interlaid scrim. The fibers of the bonded fiber fabric extend out into a plane running through the middle of the glass fiber strand 3 of the interlaid scrim, so that between the glass fiber strand 2 and the surface of the bonded fiber fabric 4, a hollow space or cavity is formed, that is free of glass fibers of the bonded fiber fabric, likewise it is the same for the glass fiber structure on the other side of the panel. The material of the mantle of the panel is consistent, that is, it is everywhere the same.

In the manufacture of the panel one would proceed as for the production of gypsum plasterboard panels. First, the "view side covering" would be inserted into the machine, for example, the one that is generally denoted by letter A. Onto this layer the

gypsum slurry would be spread out and it then forms the gypsum core 1. Due to this distribution process, the gypsum slurry penetrates into the interlaid scrim, perhaps up to the line 6, so that therefore the strand 2 and also a portion of the bonded fiber fabric will also be penetrated by the flowable gypsum slurry. Then if the rear side coating R is applied, then the same process will take place and the gypsum slurry will be pressed into the glass fiber coating by the shaping process as far as line 6, so that then the strand 2 will also be covered and a portion of the bonded fiber fabric 4.

Due to the coating of the glass fibers, in particular those of the interlaid scrim, a good mechanical bond can be achieved. In addition, according to the invention, the surface of the glass fiber coating A or R facing the gypsum slurry, can be treated with a wetting agent, for example, by spraying or printing or immersion. Due to the application of the wetting agent onto the glass fibers directly neighboring the gypsum slurry, a complete and close contact with the gypsum slurry will take place, so that not only the bond between glass fibers and gypsum slurry is improved in the finished product, but also during the manufacturing process, a faster and more complete penetration and wetting of the water-containing, flowable gypsum slurry into the glass fiber material is achieved or takes place.

Since furthermore the bonded fiber fabric on the side facing the interlaid scrim or the gypsum core has a greater pore width than on its outward-pointing surface, the flowable, water-containing gypsum slurry can penetrate relatively far into the bonded fiber fabric 4. This is shown by lines 6 and 6',

respectively, in the figure for a better understanding of the essence of the invention.

The bonding of the chopped strand mat with the glass fiber interlaid scrim and/or the placement of the glass fiber strands 2 and 3 of the interlaid scrim with respect to the bonded fiber fabric, takes place preferably by taking into account the production direction and the dimensions of the material path, so that the glass fiber strands 3 embedded in the bonded fiber fabric run preferably in the running direction or production direction of the invented panel.

The mesh width of interlaid scrim and fabric can vary; in any case it is tailored to production with the bonded fiber fabric lying on it. In this regard, refer to the fact that, e.g., the interlaid scrim can also contain different thickness of strands. The glass strands of interlaid scrim and fabric can be coated, covered, flock-sprayed or otherwise surface-treated.